Automated Tracking Station Software Training Plan Draft

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Overview

This course is designed to train selected personnel to operate and perform maintenance on the automated tracking station Master and Remote Nodes. Training encompasses station monitor and control architecture, software and limited hardware configuration as it relates to the system software.

Objective

Upon completion of this course the student will be able to configure the station for operations from the Master and Remote Nodes, analyze system status displays, isolate system failures to the LRU, remove and install LRU as it relates to the system software, recognize operating system and application software anomalies, and reload/configure Master and Remote Node software.

Prerequisites

As stated in the overview, this course is designed to train *selected* personnel. Training will be enhanced if the student is familiar with the Automated Tracking Station User's Guide available on the internet at: http://www.wff.nasa.gov/~code584/awots.html. It will also be helpful if the student brings to training actual device configurations used for real-time supports.

Duration

The estimated duration of this training is no more than 24 hours.

Equipment and Materials

A simulated operational environment is the minimum requirement. This includes one Master and Node PC, as well as a Scientific-Atlanta 11meter system. Network connections between all systems and connectivity to the WOTIS scheduling office also required. Equipment configuration parameter information would also be helpful.

Key Topics

A Guide to the Graphical User Interfaces (GUIs) – Approximate duration = 1 hour

Many of the software applications developed for the automated tracking station include a graphical user interface (GUI). A GUI includes a window, or collection of windows, displayed on the computer screen that provides a user with a mechanism for interacting with the software to issue commands, select options, and enter input. Additionally, the software uses GUIs to present status data to the user. One of the goals in developing the user interface portions of the automation software was to maintain a consistent look and feel across applications. In general, the user interface applications have been developed with an attempt to maximize their usefulness to the user while minimizing the interaction required by the user. Every attempt has been made to make the user interface applications straightforward and intuitive. Thus, while user interface software has been developed by a variety of software developers with input from a diversity of potential end-users for a wide range of devices, there are some general guidelines that apply to all applications.

Using the Device Interfaces – Approximate duration = 3 hours

Device interface applications provide an interface with which the user can exercise control, monitor the status, and define the configuration of a device. They can serve as both pre-support utilities and support critical processes. A device interface includes a GUI and device driver and command classes. Device interfaces are available for the following devices:

- Avtec 1000 programmable telemetry processor
- Aydin 329A BPSK demodulator
- Decom Systems 7715 bit synchronizer
- General Data Products 225D frame synchronizer
- General Data Products 233 PCM simulator
- General Data Products 783M BPSK subcarrier/modulator
- Hewlett Packard 3325B synthesizer
- Hewlett Packard E1366/67A RF matrix switch
- Krohn-Hite 3905B programmable filter
- Metrum BVLDS cassette digital tape recorder
- Optrax SS100-B digital matrix switch
- Optrax SS300-3S analog matrix switch
- Scientific Atlanta 11-meter antenna (covered in a later session)
- WFF telemetry data formatter

Creating a Support Profile – Approximate duration = 4 hours

The Master defines its configuration for and behavior during scheduled support activity based on the contents of a support profile. A support profile is a collection of files that describe the mission characteristics, support specifications, resource requirements, and test procedures for a support. Support profiles can be created and modified by a user in anticipation of support activity. Moreover, the user can modify a support profile for a scheduled event up until that time at which the Master begins setup procedures for the support. This session will cover the use of the Profile Editor utility.

What is the Profile Editor?
The Profile Editor is a utility application which allows the user to create and edit configurations of device resources and other information which form a support profile.

How do I start it?

How do I add devices to the profile?

How do I select the configuration of a device?

How do I select the configuration of the antenna?

How can I tell if the correct profile has been assigned to a pass?

How can I change the profile that has been assigned to a pass?

System Overview – Approximate duration = 4 hours

The Master includes a collection of independent processes that work together to provide centralized control and monitoring of the tracking station. The system includes the *core processes* and *utilities*, in addition to the previously covered *device interfaces.* The core processes include those processes that must be running

on at least one Master in order for the automated tracking station to accomplish the operational schedule. Utilities include station, support, and device configuration editors with which station specific characteristics can be identified and anticipated supports can be defined. While each of the processes is independent, each of the processes is, in its way, essential to reliable performance of the Master.

List of Core Processes

The Master includes the following core processes:

- 11-meter Antenna Interface
- Scheduler
- Monitor and Control
- WOTIS Interface
- General Resources Manager (GRM)
- Pass Results Compiler
- Station Status Broadcaster

List of Utilities

- Station Assets Editor
- Profile Editor (covered in an earlier session)
- Master Password Editor
- Station Status Display
- Shipping Report Writer
- Manual Schedule Notification

Automation Testing

Initializing the System

Scientific-Atlanta 11meter Hewlett-Packard Software

Node PC Initialization

Node PC initialization ***must*** precede Master PC startup. The following set of actions will initialize the remote nodes to prepare for automation:

(1) Login to each node as user *Operator*. See system administrator for password.
(2) Allow 60 seconds for the *General Resources Manager Devices* application to start automatically. This application will establish initial communication with each connected device.
(3) Start the *General Resources Manager Operations* application by selecting it from the *Start* menu. This application prepares the devices to accept remote commands.

Master PC Initialization

After Nodes are initialized, login to one Master PC as user *Operator*. See system administrator for password. All Master core processes, with the exception of *11mInterface.exe* and *StationStatusBroadcaster.exe,* are started automatically at startup. The operator can elect to start these other two core processes immediately at startup or at a later time. Answering "*Yes*" to the *Scheduling Master* question at startup will start *11mInterface.exe* and allow the Master to begin automatic scheduling. The *Reporting Master* option will allow the Master to broadcast instrument status data to all remote clients.

Core Processes

11-meter Antenna Interface (c:\Master\11mInterface.exe)

What is it?

The 11-meter Antenna Interface is a multi-threaded Windows NT application which coordinates communication between the Master and the Scientific Atlanta (SA) 11-meter Antenna Hewlett-Packard (HP) system. This process is responsible for forwarding schedule and ephemeris requirements to the antenna system and directing it to load the schedule.

Communication between the Master PC and HP is accomplished using a 2-way TCP/IP socket connection. One socket is initialized in order to send messages from the Master to the HP. These messages include:

(1) request for socket connection;
(2) request for remote login;
(3) request for directory names containing 11meter passlogs, tapelogs and configurations;
(4) request for directory names where remote schedules and ephemeris files should be delivered;

The above four messages are delivered when the 11mInterface process begins execution. The following three messages are delivered at support *INITIALIZATION* time (usually AOS – 10 minutes):

(5) request for *control upgrade* status in order to prepare for loading schedule and ephemeris files;
(6) request to *load* the schedule or ephemeris file.
(7) request for *control downgrade* status in order to release remote control back to the HP console.

A second TCP/IP socket is created in order to listen and receive instrument status packets and grant approval for *login* and *control upgrade* requests. The initialization of these two sockets forces the Master PC to function as the *Scheduling Master*.

How do I start it?

This core process is not started automatically. There are three methods available to start this process.
(1) Answer "*Yes"* to the question "*Should this Master be the Scheduling Master?"* at Master PC startup.
(2) Select *"Make this the Scheduling Master"* option under the *Workstation* menu during Master startup.
(3) Select *"Start the 11m Antenna Interface"* option under the *System* menu after Master startup.

How do I know it's working?

The *11mInterface* process must be executing without communication errors in order to schedule the 11meter antenna HP, as well as other node-controlled equipment. Look for the following messages in the message log immediately after execution in order to gain some confidence regarding process behavior:

"The 11mAntenna Interface has been started."
"This Master is now the Scheduling Master."
"11mInterface … Send socket initialized for SA11meter#1 at WPS"
"11mInterface … Listen socket initialized for SA11meter#1 at WPS"
"11mInterface … Sending login request to 11meter XIFSOCK"
"11mInterface … Remote login to 11meter system approved"

The *11mInterface* process is also executing correctly when the 11meter high-level status window is being updated with status packet information.

To ensure communication success, the following messages will appear in the 11meter HP status message window in the lower left of the 11meter HP GUI:
"Accepted remote socket connection."
"Remote user logged in."

"Remote request for passlog."
"Remote request for tapelog."

How do I know schedule and ephemeris have been delivered to the 11meter HP?
At support *INITIALIZATION* (usually AOS – 10 mins.), a specially-formatted 11meter schedule file is created on the Master at *c:\Master\Schedule\SA11meter.scd* . A second ASCII text file, *c:\Master\Schedule\SA11meter.eph* , is also created for delivery to the HP. After file preparation on the Master the following actions occur:

(1) Remote request for *control upgrade* .
(2) FTP of *c:\Master\Schedule\SciAt11mEph.scd* to */$HOME/etc/remote/rciEphem* on the HP.
(3) Remote request to *load* the ephemeris file.
(4) FTP of *c:\Master\Schedule\SciAt11mPass.scd* to */$HOME/etc/remote/rciSched* on the HP.
(5) Remote request to *load* schedule file.
(6) Remote request for *control downgrade* in order to return control back to the HP operator.

The automatically scheduled support will be displayed in the upper right of the 11meter HP GUI at *"NEXT SCHEDULED EVENT"* if the above actions succeed.

What can I do if the support schedule is not delivered to the 11meter HP?
A support can fail to be scheduled on the 11meter HP for a variety of reasons. They include:

(1) Master has not been designated as the *Scheduling Master* because the 11mInterface is not executing,
(2) 11mInterface is executing, but has experienced some communication failure, or
(3) remote ephemeris file delivered from the Master contains acquisition pointing vectors that do not agree with an S-A prediction of AOS.

Operator intervention at the HP console using the SA GUI is required to manually input the support if automatic scheduling fails.

How do I detect communication failure problems?
Communication failure between the Master and 11meter HP is the source for most automatic schedule failures. Any or all of the following messages will be displayed in the Master message log when communication problems persist:

"11m Interface … Cannot initialize send socket to 11meter XIFSOCK."
"11m Interface … Cannot initialize listen socket to 11meter XIFSOCK."
"11mInterface … Cannot read NASA message header for 11m XIFSOCK for WPS."
"11mInterface … Cannot get 11meter message packet."

Even if the sockets are initialized correctly, the SA HP may fail to grant the Master a remote login privilege as indicated by:
"11mInterface … Remote login to 11meter system approved"

This problem can be noted with an endless display of :
"11mInterface … Sending login request to 11meter XIFSOCK"
"11mInterface … Sending login request to 11meter XIFSOCK"
"11mInterface … Sending login request to 11meter XIFSOCK"

"11m Interface … 11meter interface shutdown by Master"
"11m Interface … Terminated Read11mMessage thread"
"11m Interface … Terminated Send11mMessage thread"
"11m Interface … Terminated 11mInterface process"
"

Q: "What happens if the Master schedules the 11meter HP before another support is completed?"
A: This is bad. It will result in the 11meter antenna abruptly terminating the current support in order to accommodate the upcoming one. There is no feature – like appending schedules – in the SA software to prevent this problem. The Master PC has no capability to resolve scheduled conflicts; it depends on individuals in the WOTIS scheduling office to deliver conflict-free schedule files.

Q: "How does the Master know where to send the 11meter schedule and ephemeris files?"
A: The IP address of the 11meter HP and other network connection information is contained in the WS_FTP32 profile for the system. The name of this WS_FTP32 profile – like *"SA11Meter#1"* is editable using the station assets editor.

Q: "Why does the window appear on the 11meter HP asking to grant control upgrade status to a remote host during schedule delivery?"
A: This window is displayed to warn an operator on the HP in local *control upgrade* status when the remote Master is attempting to grab control in order to load schedule and ephemeris. The operator should answer *"OK"* to allow remote control to the Master to complete automatic scheduling. The SA software will default to *"OK"* and relinquish control to the Master in thirty seconds if no response by an operator is given. This window remains on the HP screen until someone clicks *"OK"*; this is a well-documented bug in the SA software.

Q: "Does the 11meter HP have to be in control downgrade status to receive the Master schedule?"
A: Absolutely not. Under normal automation circumstances, the Master will grab control, load the schedule and return the SA HP back into a *control downgrade* status.

Q: "What does the following series of messages in the Master message log mean?"
"11mInterface … Cannot read NASA message header from 11m XIFSOCK for WPS."
"11mInterface … Cannot get 11meter message packet."
"11mInterface … 11meter interface shutdown internally."
A: These messages suggest that the SA 11meter HP was *"Stopped"* without warning at the Master PC. This condition will force the *11mInterface.exe* to terminate on the Master PC. Occasional communication problems have been observed in subsequent connections between the Master and 11meter HP. Operator should follow the 9-step procedure discussed above in ***How do I detect communication failure problems?***

Scheduler (c:\Master\Scheduler.exe)

Scheduler.exe is a Master core process that is responsible for the following critical activities:

(1) Reading the WOTIS-delivered schedule file, *c:\Master\Schedule\wotrs.mas* .
(2) Sorting through the contents of the schedule file to parse information for only those supports that can be accommodated on the Master. This information is arranged in another ASCII text file, *c:\Master\Schedule\AutomatedOps.scd.* Currently, this operational schedule includes only SA 10meter and 11meter antenna operations.
(3) Identifying a base profile from the list contained at *c:\Master\Profiles* to a scheduled support in the WOTIS-delivered operational schedule. Currently the Master identifies a base profile to a scheduled support by matching satellite Ids, operation types and receive/transmit antennas. These operational profiles are created for each individual support at *c:\Master\OpProfiles* .
(4) Time-sorting all scheduled supports and resource information contained in the base profiles. This list can be viewed by selecting the *"View Things to do list"* option in the *Operational Schedule* window. The text file for this list is at *c:\Master\Schedule\ThingsToDo.txt* .

How do I start it?
This core process is started automatically when user *Operator* logs in.

How can I tell if it is working correctly?
What if the schedule is not received?
How can I delete a pass from the schedule?

How can I change information in a pass?
What are some other things that can go wrong and how can I address these problems?

Monitor and Control

(This topic is discussed in *Master PC Initialization.*)
What are some things that can go wrong and how can I address these problems?
How can I get information about a device?
How can I control a device?

WOTIS Interface

What is the WOTIS interface and what does it do?

How do I start it?
This core process is started automatically when user *Operator* logs in.

How can I tell if it is working correctly?
What are some things that can go wrong and how can I address these problems?

General Resource Manager (GRM)

(This topic is discussed in *Using the Device Interfaces.*)
What are some things that can go wrong and how can I address these problems?

Pass Results Compiler

What is the pass results compiler and what does it do?

How do I start it?
This core process is started automatically when user *Operator* logs in.

How can I tell if it is working correctly?
What if a takedown message did not get sent?
What if the 11-meter did not FTP its file?
What if the pass results file did not process?
What if the pass results file did not get FTPed?
What are other some things that can go wrong and how can I address these problems?

Station Status Broadcaster

What is the station status broadcaster and what does it do?
How do I start it?
How can I tell if it is working correctly?
What are some things that can go wrong and how can I address these problems?

Utilities

Station Assets Editor

What is the station assets editor and what does it do?
How do I start it?
How can I tell if it is working correctly?
What are some other things that can go wrong and how can I address these problems?

Profile Editor

(This topic is discussed in *Creating a Support Profile.*.)
What are some other things that can go wrong and how can I address these problems?

Master Password Editor

What is the master password editor and what does it do?
How do I start it?
How can I tell it is working correctly?
What are some other things that can go wrong and how can I address these problems?

Station Status Display

What is station status display and what does it do?
How do I start it?
How can I tell it is working correctly?
What are some other things that can go wrong and how can I address these problems?

Shipping Report Writer

What is shipping report and what does it do?
How do I start it?
How can I tell it is working correctly?
What are some other things that can go wrong and how can I address these problems?

Manual Schedule Notification

What is manual schedule notification and what does it do?
How do I start it?
How can I tell it is working correctly?
What are some other things that can go wrong and how can I address these problems?